

## CHAPTER 8

### NATIONAL DATA BUOY CAPABILITIES AND REQUIREMENTS

#### 8.1. General.

**8.1.1. Automated Reporting Stations.** The National Data Buoy Center (NDBC) maintains automated reporting stations in the Gulf of Mexico, in the coastal areas and deep ocean of the Atlantic and Pacific Oceans, and in the Great Lakes. These data acquisition systems obtain measurements of meteorological and oceanographic parameters for operations and research purposes. Moored buoy station locations and configurations are given in Table 8-1. The locations of Coastal-Marine Automated Network (C-MAN) stations are listed in Table 8-2. Figures 8-1 through 8-3 show the locations of all moored buoys and C-MAN stations. Figure 8-4 is a detailed chart of the network in the Gulf of Mexico and along the southeast U.S. coast. The operational status and measurement capability of stations can be obtained from NDBC *Operations Branch*, Stennis Space Center, MS 39529-6000, phone 228-688-3134, or on-line via NDBC's home page on the World Wide Web (www) at <http://www.ndbc.noaa.gov>. *Several new stations will be installed in the Gulf of Mexico and the Atlantic during the summer of 2002. Please check the NDBC web page for network updates.*

**8.1.2. Data Acquisition.** Moored buoy and C-MAN stations routinely acquire, store, and transmit data every hour; a few selected stations report more frequently. Data obtained operationally include sea-level pressure, wind speed and direction, peak wind, and air temperature. Sea-surface temperature and wave spectra data are measured by all moored buoys and a limited number of C-MAN stations. Relative humidity is also measured at several stations.

#### 8.1.3. Drifting Buoys.

**8.1.3.1. NDBC.** NDBC is capable of acquiring, preparing, and deploying drifting buoys; however, a NOAA operational drifting buoy requirement has not been identified or funded. Research interests should contact NDBC directly with drifting buoy requirements.

**8.1.3.2. Navy.** Since 1998, the Naval Oceanographic Office (NAVOCEANO) has deployed meteorological drifting buoys to report surface meteorological and oceanographic measurements, for operational purposes, as tropical systems move through data sparse regions tracking toward the U.S. East Coast. Additionally, Navy drifting buoys have been deployed in the Intertropical Convergence Zone (ITCZ). The drifting buoy measurements, which are available to tropical forecasters, provide invaluable input for defining tropical storm movement and intensity, improve forecast model initialization, and give tropical forecasters a much better sense of storm characteristics and track as they approach the fleet concentration areas of Jacksonville, FL, and Norfolk, VA. Drifting buoys typically have a life span of 1 to 2 years, and the data are available through the NAVOCEANO homepage and through standard World Meteorological Organization (WMO) data sources.

NAVOCEANO acquires, prepares, and deploys drifting meteorological buoys based on operational requirements identified by Commander-in-Chief, Atlantic Fleet (CINCLANTFLT). Currently, CINCLANTFLT has identified the Navy's drifting buoy support as a standing requirement to support fleet safety, assist in fleet sortie decisions, and enhance tropical weather preparedness.

**8.2. Requests for Drifting Buoy Deployment.** Drifting buoy deployments should be coordinated with the Department of Commerce (DOC), through the National Oceanic and Atmospheric Administration (NOAA). NOAA will initiate a request through the Office of the Federal Coordinator for Meteorology (OFCM). The request for deployment support will then be sent to the 53rd Weather Reconnaissance Squadron (53 WRS) through HQ Air Force Reserve Command (AFRC). Deployments in advance of a U.S. land-threatening hurricane require a 36- to 48-hour notification. All requests will include specific information, regarding onloading base, accompanying technicians, desired pickup times, reimbursement funding, and other pertinent data.

**8.2.1. Tropical Prediction Center/National Hurricane Center (TPC/NHC).** TPC/NHC forecasters will issue through the Tropical Cyclone Plan of the Day (TCPOD) an alert or outlook for drifting buoy deployment 48 hours prior to the planned deployment. Hard tasking for the deployment will be issued 14 hours prior to the event via the TCPOD.

**8.2.2. Deployment Buoys.** DOC may request the deployment of up to four drifting buoys between 185 and 333 km (100 and 180 nm) from the storm center, depending on the dynamics of the storm system. DOC will ensure the buoys and mission-related DOC personnel are available for pickup by AFRC aircraft. The specific DOC request for placement of the buoys will depend on several factors, including:

- Characteristics of the storm, including size, intensity, and velocity.
- Storm position relative to the coast and population centers.

**8.2.3. Deployment Position.** The final deployment position will be provided before the flight crew briefing. Two examples of possible buoy deployment patterns are shown in Figure 8-5.

**8.3. Communications.** Moored buoy and C-MAN data are transmitted via the Geostationary Operational Environmental Satellite (GOES) to the National Environmental Satellite, Data, and Information Service (NESDIS) and then are relayed to the NWS Telecommunications Gateway (NWSTG) for processing and dissemination. Moored buoy observations are formatted into the World Meteorological Organization (WMO) FM 13-IX SHIP code. The SHIP code is defined in Federal Meteorological Handbook No. 2, Surface Synoptic Codes. C-MAN measurements are formatted into C-MAN code, which is very similar to the WMO FM 12-IX SYNOP code. Code forms are shown in Table 8-3. The C-MAN code is contained in the C-MAN Users' Guide, which is available from NDBC. Drifting buoy data are sent through NOAA's polar-orbiting environmental satellites (POES) to the U.S. Argos Global Processing Center, Largo, MD. Service Argos processes and formats the data into the WMO FM 18 BUOY code defined in the *WMO Manual on Codes*, Volume I. The messages are then routed to the NWSTG for distribution.

**Table 8-1. Moored buoy locations and configurations**

SITE	STATION ID	LOCATION	HULL SIZE (m)	ANEMOMETER HEIGHT (m)
GULF OF MEXICO	42001	25.9EN 89.7EW	10	10
	42002	25.9EN 93.6EW	10	10
	42003	25.9EN 85.9EW	10	10
	42007	30.1EN 88.8EW	3	5
	42019	27.9EN 95.4EW	3	5
	42020	26.9EN 96.7EW	3	5
	42035	29.2EN 94.4EW	3	5
	42036	28.5EN 84.5EW	3	5
	42039 <sup>1</sup>	28.8EN 86.0EW	3	5
	42040 <sup>1</sup>	29.2EN 88.2EW	3	5
	42054	26.0EN 87.7EW	12	10
ATLANTIC OCEAN	41001	34.7EN 72.6EW	6	5
	41002	32.3EN 75.2EW	6	5
	41004	32.5EN 79.1EW	3	5
	41008	31.4EN 80.9EW	3	5
	41009 <sup>1</sup>	28.5EN 80.2EW	3	5
	41010 <sup>1</sup>	28.9EN 78.5EW	6	5
	44004	38.5EN 70.7EW	6	5
	44005	42.9EN 68.9EW	6	5
	44007	43.5EN 70.1EW	3	5
	44008	40.5EN 69.4EW	3	5
	44009	38.5EN 74.7EW	3	5
	44011	41.1EN 66.6EW	6	5
	44013	42.4EN 70.7EW	3	5
	44014 <sup>1</sup>	36.6EN 74.8EW	3	5
	44025	40.3EN 73.2EW	3	5
PACIFIC OCEAN (SOUTH OF 45EN)	46002	42.5EN 130.3EW	6	5
	46006	40.8EN 137.5EW	6	5
	46011	34.9EN 120.9EW	3	5
	46012	37.4EN 122.7EW	3	5
	46013	38.2EN 123.3EW	3	5
	46014	39.2EN 124.0EW	3	5
	46022	40.8EN 124.5EW	3	5
	46023 <sup>1</sup>	34.7EN 121.0EW	3	5
	46025	33.8EN 119.1EW	3	5
	46026	37.8EN 122.8EW	3	5
	46027	41.9EN 124.4EW	3	5
	46028	35.7EN 121.9EW	3	5
	46029	46.1EN 124.5EW	3	5
	46030	40.4EN 124.5EW	3	5
	46042	36.8EN 122.4EW	3	5
	46047	32.4EN 119.5EW	3	5
	46050	44.6EN 124.5EW	3	5
	46053	34.2EN 119.8EW	3	5
	46054 <sup>1</sup>	34.3EN 120.4EW	10	10
	46059	38.0EN 130.0EW	6	5
	46062 <sup>1</sup>	35.1EN 121.0EW	10	10
	46063	34.3EN 120.7EW	6	5
	51001	23.4EN 162.3EW	6	6
	51002	17.2EN 157.8EW	6	6
	51003	19.2EN 160.7EW	6	6
	51004	17.4EN 152.5EW	6	5
	51028 <sup>1</sup>	0.0EN 153.9EW	3	5

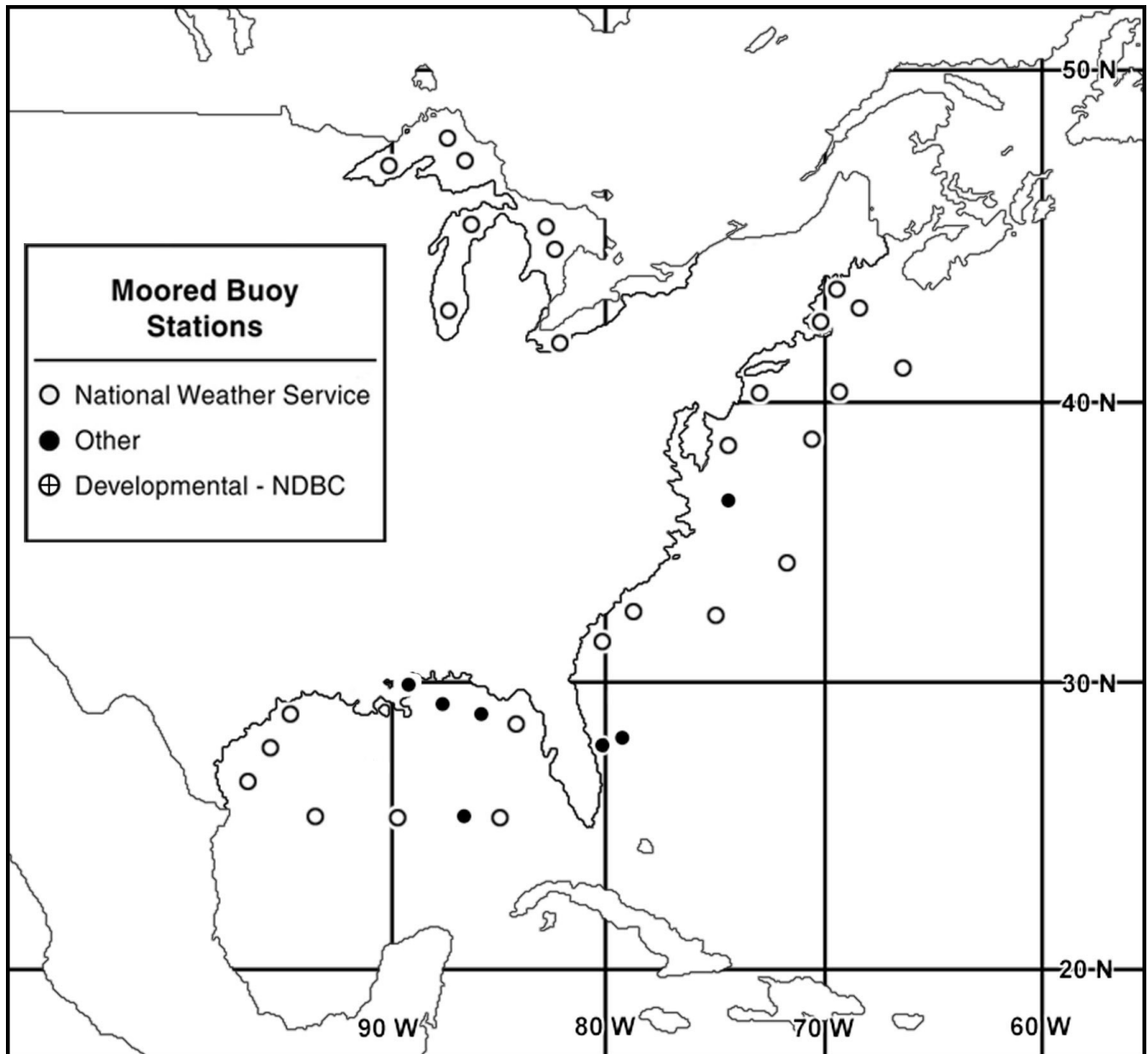
<sup>1</sup>Temporary site established with other special funding.

**Table 8-2. C-MAN sites**

SITE	STATION ID	LOCATION	STATION NAME
GULF OF MEXICO	BURL1	28.9EN 89.4EW	Southwest Pass, LA
	CDRF1 <sup>1</sup>	29.1EN 83.0EW	Cedar Key, FL
	CSBF1	29.7EN 85.4EW	Cape San Blas, FL
	DPIA1	30.3EN 88.1EW	Dauphin Island, AL
	DRYF1 <sup>1</sup>	24.6EN 82.9EW	Dry Tortugas, FL
	GDIL1	29.3EN 90.0EW	Grand Isle, LA
	KTNF1 <sup>1</sup>	29.8EN 83.6EW	Keaton Beach, FL
	LONF1 <sup>1</sup>	24.8EN 80.9EW	Long Key, FL
	PTAT2	27.8EN 97.1EW	Port Aransas, TX
	SRST2	29.7EN 94.1EW	Sabine, TX
	VENF1	27.1EN 82.4EW	Venice, FL
ATLANTIC OCEAN	ALSN6	40.5EN 73.8EW	Ambrose Light, NY
	BUZM3	41.4EN 71.0EW	Buzzards Bay, MA
	CHLV2	36.9EN 75.7EW	Chesapeake Light, VA
	CLKN7	34.6EN 76.5EW	Cape Lookout, NC
	DSL7	35.2EN 75.3EW	Diamond Shoals, NC
	DUCN7	36.2EN 75.8EW	Duck Pier, NC
	FBIS1	32.7EN 79.9EW	Folly Island, SC
	FPSN7	33.5EN 77.6EW	Frying Pan Shoals, NC
	FWYF1 <sup>1</sup>	25.6EN 80.1EW	Fowey Rocks, FL
	IOSN3	43.0EN 70.6EW	Isle of Shoals, NH
	LKWF1	26.6EN 80.0EW	Lake Worth, FL
	MDRM1	44.0EN 68.1EW	Mt. Desert Rock, ME
	MISM1	43.8EN 68.9EW	Matinicus Rock, ME
	MLRF1	25.0EN 80.4EW	Molasses Reef, FL
	SANF1 <sup>1</sup>	24.5EN 81.9EW	Sand Key, FL
	SAUF1	29.9EN 81.3EW	St. Augustine, FL
	SMKF1	24.6EN 81.1EW	Sombrero Key, FL
	SPGF1	26.7EN 79.0EW	Settlement Point, GBI
	TPLM2	38.9EN 76.4EW	Thomas Point, MD
EASTERN PACIFIC OCEAN (SOUTH OF 45EN)	CARO3	43.3EN 124.4EW	Cape Arago, OR
	NWPO3	44.6EN 124.1EW	Newport, OR
	PTAC1	39.0EN 123.7EW	Point Arena, CA
	PTGC1	34.6EN 120.6EW	Point Arguello, CA

<sup>1</sup>Temporary site established with other special funding.

<sup>2</sup>Station is expected to be moved offshore approximately 2 nm south of its present location by 6/1/01.



**Figure 8-1. NDBC moored buoy locations in the Atlantic Ocean, the Gulf of Mexico, and the Great Lakes**

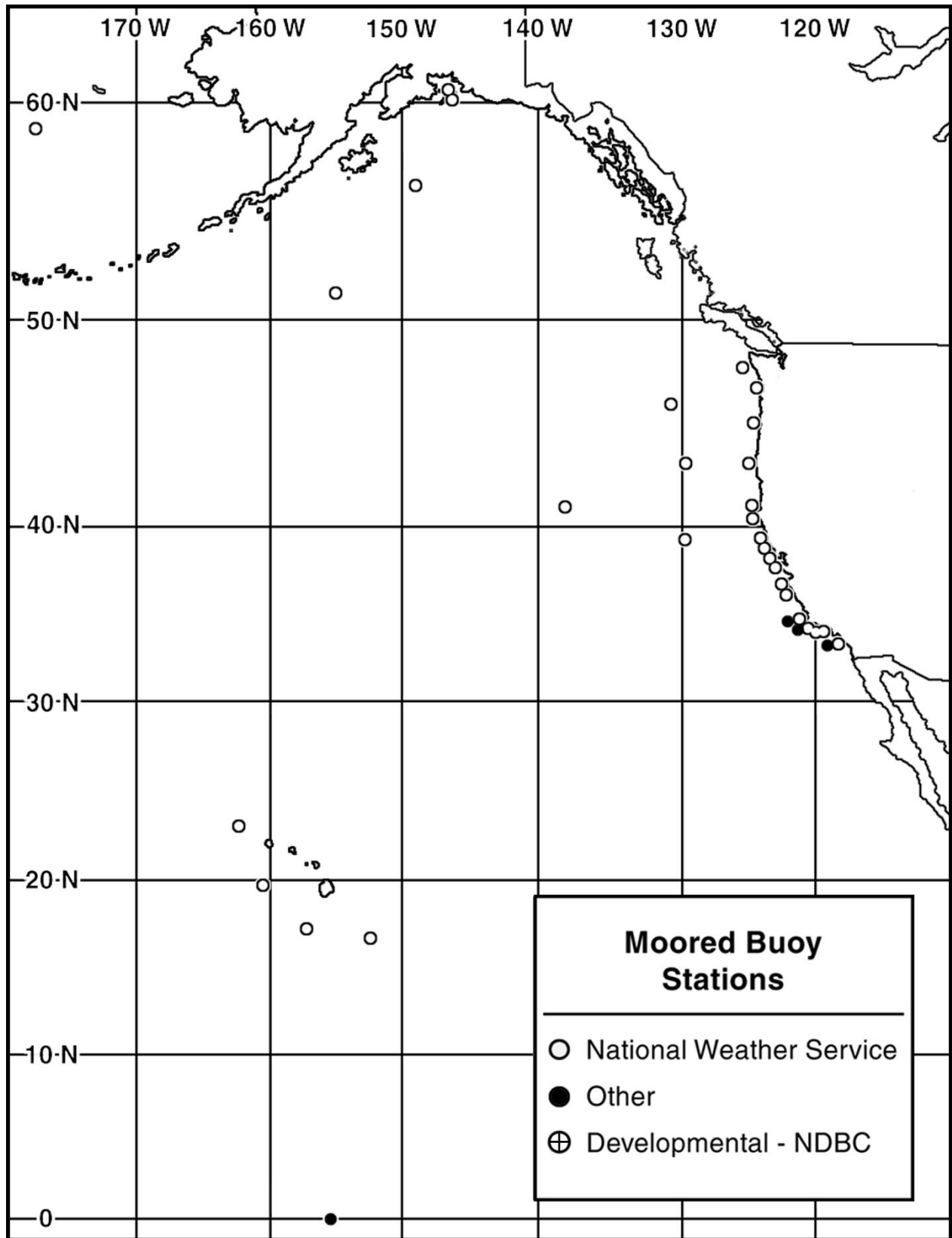


Figure 8-2. NDBC moored buoys in the Pacific Ocean

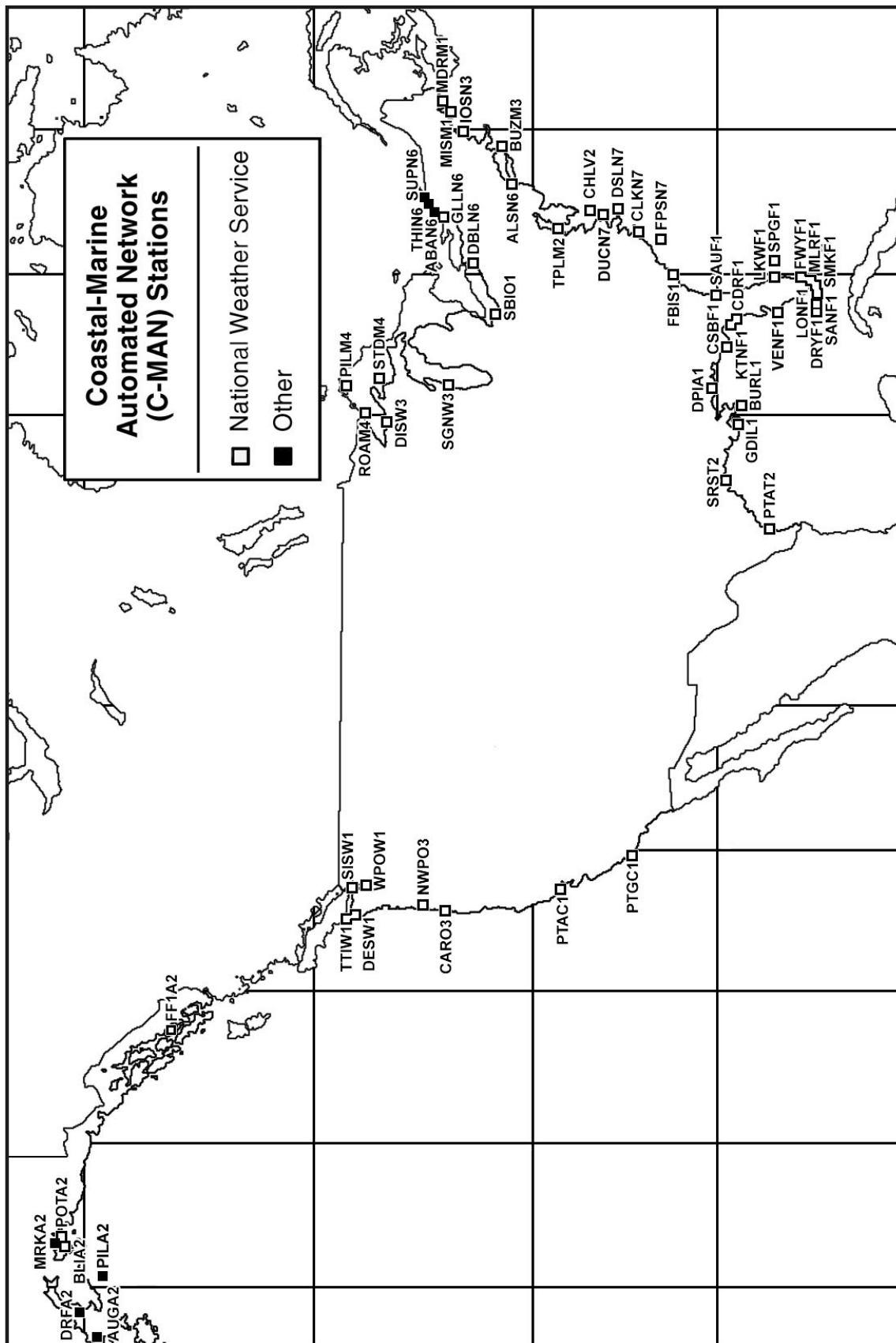


Figure 8-3. C-MAN stations in the coastal U.S.

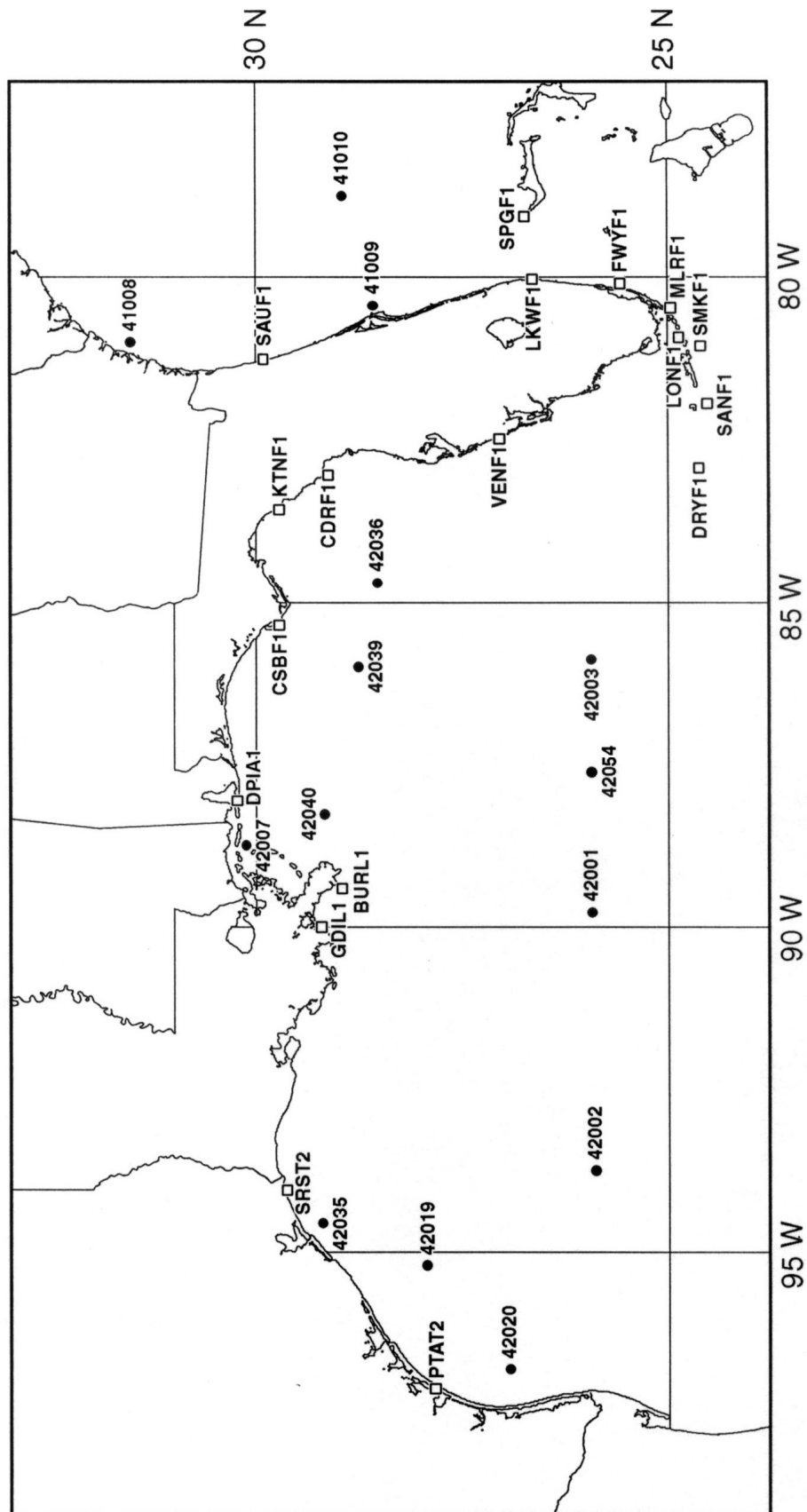
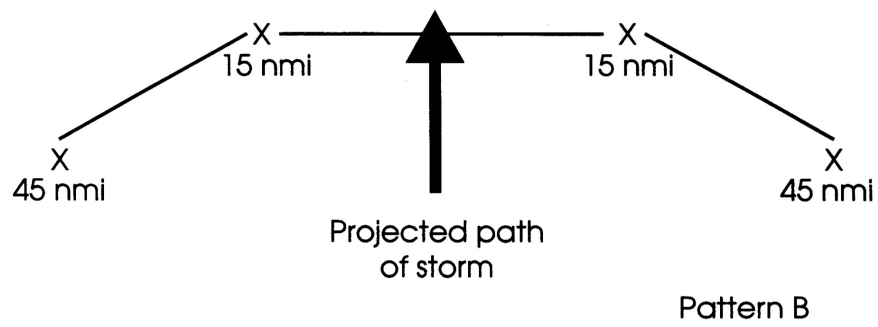
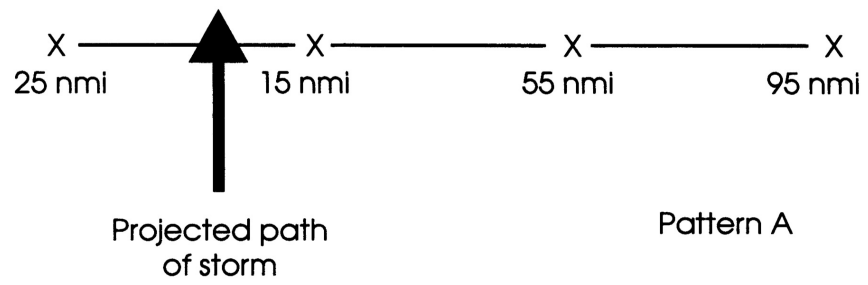


Figure 8-4. NDBC planned and current Gulf of Mexico moored buoy network





**Figure 8-5. Drifting data buoy deployment patterns**

**Table 8-3. Code forms for moored data buoys, C-MAN stations, and drifting buoys**

FORM	CODE
FM 13-IX (SHIP) REPORT OF SYNOPTIC SURFACE OBSERVATION FROM A SEA STATION (AUTOMATIC WEATHER STATION)	<p> <math>M_i M_j M_k M_l A_1 b_w n_b n_b n_b YYGGi_w 99L_a L_a L_a Q_c L_o L_o L_o L_o</math>  <math>i_i i_x /// /ddff 1s_n TTT (2s_n T_d T_d T_d) 3P_o P_o P_o 4PPPP 5appp 9GGgg</math>  <math>22200 Q_s T_w T_w T_w 1P_{wa} P_{wa} H_{wa} H_{wa} 70 H_{wa} H_{wa} H_{wa}</math>  <math>333 912ff (00fff)</math>  <math>555 11fff 22fff (3GGgg 4ddf_m f_m)</math>  <math>(6G_c G_c g_c g_c d_1 d_1 d_1 f_1 f_1 f_1 d_6 d_6 d_6 f_6 f_6 f_6) d_2 d_2 d_2 f_2 f_2 f_2 d_3 d_3 d_3 f_3 f_3 f_3</math>  <math>d_4 d_4 d_4 f_4 f_4 f_4 d_5 d_5 d_5 f_5 f_5 f_5</math> </p>
U.S. NATIONAL (C-MAN LAND STATION) MODIFIED FM 12-IX	<p> <math>CMAN YYGGi_w</math>  <math>XXXXXn_i i_{R_x} hV V Nddff (00fff) 1s_n TTT 2s_n T_d T_d T_d 3P_o P_o P_o 4PPPP</math>  <math>5appp 6RRRt_r 9GGgg</math>  <math>222// 0s_n T_w T_w T_w 1_{wa} P_{wa} P_{wa} H_{wa} H_{wa} 70H_{wa} H_{wa} H_{wa}</math>  <math>333 912ff (00fff)</math>  <math>444 1P_{av} P_{av} P_{av} /</math>  <math>555 11fff 22fff (3GGgg) (4ddf_m f_m f_m)</math>  <math>(6G_c G_c g_c g_c d_1 d_1 d_1 f_1 f_1 f_1 d_6 d_6 d_6 f_6 f_6 f_6) d_2 d_2 d_2 f_2 f_2 f_2 d_3 d_3 d_3 f_3 f_3 f_3 d_4 d_4 d_4 f_4 f_4 f_4</math>  <math>d_5 d_5 d_5 f_5 f_5 f_5 (TIDE1111)</math> </p>
FM 18 BUOY REPORT OF A DRIFTING BUOY OBSERVATION	<p> Section 0: <math>ZZYY A_1 b_w n_b n_b n_b YYMMJ GGggi_w Q_c L_a L_a L_a L_a L_a L_o L_o L_o L_o L_o L_o YYMMJ</math>  <math>6Q_1 Q_1 O_d /</math>  Section 1: <math>\underline{111}Q_d Q_x 0ddff (1s_n TTT) [(2s_n T_d T_d T_d) \text{ or } (29UUU)] (3P_o P_o P_o P_o)</math>  <math>(4PPPP) (5appp)</math>  Section 2: <math>\underline{222}Q_d Q_x (0S_n T_w T_w T_w) (1P_{wa} P_{wa} H_{wa} H_{wa}) (20P_{wa} P_{wa} P_{wa}) (21H_{wa} H_{wa} H_{wa})</math>  Section 3: <math>\underline{333}Q_{d1} Q_{d2} (8887k_2 2z_0 z_0 z_0 z_0 3T_0 T_0 T_0 T_0 4S_0 S_0 S_0 S_0</math>  <math>.... ....</math>  <math>2z_n z_n z_n z_n 3T_n T_n T_n T_n 4S_n S_n S_n S_n)</math>  <math>(66k_6 9k_3 2z_0 z_0 z_0 z_0 d_0 d_0 c_0 c_0 c_0</math>  <math>.... ....</math>  <math>2z_n z_n z_n z_n d_n d_n c_n c_n c_n)</math>  Section 4: <math>\underline{444} (1Q_p Q_2 Q_{tw} Q_4) (2Q_n Q_L /) [(Q_c L_a L_a L_a L_a L_a L_o L_o L_o L_o L_o L_o \text{ or } (YYMMJ GGgg)] (8V_i V_i V_i V_i) (9i_d Z_d Z_d Z_d Z_d)</math> </p>